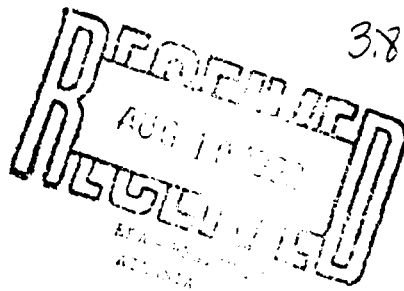


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**Woodward-Clyde Consultants**

August 7, 1992

Ms. Cheryl Walker Smith  
Senior Remedial Project Manager  
United States Environmental Protection Agency  
345 Courtland Street Northeast  
Atlanta, Georgia 30365



Re: Health and Safety Plan Addendum  
Phase III Sampling  
RI/FS for McIntosh Plant Site  
Olin Chemicals  
McIntosh, Alabama  
WCC File 90B449C  
Document Control Number WCC-310

Dear Ms. Smith:

Enclosed is a copy of an addendum to the May 1991 Health and Safety plan for the Olin McIntosh RI/FS. This addendum covers the Phase III sampling activities, and is being sent to you at the request of Mr. Jim Brown of Olin.

If you have any questions concerning this addendum, please contact us at 504/751-1873.

Very truly yours,

William A. Beal

Dennis E. Reece

WAB:kdI  
Attachment

cc: Mr. Jim Brown

90B449C-3F/CWSMITH.310 OLIN



**Woodward-Clyde Consultants**

**ADDENDUM 90B449C-3F  
HEALTH AND SAFETY PLAN**

**PHASE III SAMPLING  
OLIN McINTOSH RI/FS**

**Woodward-Clyde  
Consultants****ADDENDUM 90B449C TASK 3F****HEALTH AND SAFETY PLAN**

This is an addendum to the original Health and Safety Plan for Olin Corporation, McIntosh, Alabama, WCC Project Number 90B449C.

All provisions of the original Health and Safety Plan apply except as follows (changes to the original have been incorporated and referenced by section number):

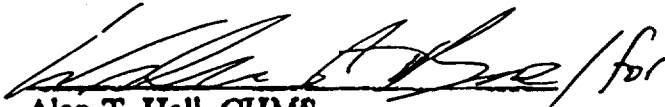
**1.0 PROJECT IDENTIFICATION**

WCC Project Name: Phase III Sampling Olin McIntosh RI/FS  
WCC Project Number: 90B449C-3F  
WCC Project Manager: William A. Beal  
Effective Dates of Plan: August 10, 1992 Through October 1, 1992  
Expiration Date of Plan: October 2, 1992

**Addendum 90B449C Task 3F Approvals**

  
William A. Beal  
Project Manager

8/6/92  
Date

  
Alan T. Hall, CHMS  
Health and Safety Coordinator  
Mississippi/Alabama Operating Unit

8/7/92  
Date

  
Charles Self, C. E. H.  
Health and Safety Officer  
Gulf Coast Operating Group

8/8/92  
Date

## **2.0 INTRODUCTION**

No change.

### **2.1 Purpose and Scope**

Focuses on health and safety issues for the work outlined in Section 4.0 of the addendum.

## **3.0 PROJECT DESCRIPTION**

No change.

## **4.0 WORK ACTIVITIES**

The Phase III sampling will consist of borings and soil sampling at Solid Waste Management Units (SWMUs) in Operable Unit 1. Work in Operable Unit 2 will consist of grab samples from the wetlands area, a grab sample from the Tombigbee River, macroinvertebrate sampling and an additional core from the wastewater ditch.

### **4.1 Operable Unit 1**

The work in Operable Unit will be performed by WCC and Layne Environmental Services (a WCC subcontract driller). The OU-1 activities are described below.

#### Old Plant Landfill

The site of the old plant Crop Protection Chemicals (CPC) landfill was utilized until 1972 to neutralize acidic wastewater from CPC plant operations. Neutralization was conducted by flowing the wastewater over piles of oyster and clam shells. The flow was then directed by an overflow ditch to the main plant wastewater ditch. Plant personnel indicate that the former landfill also received organic wastes from the CPC plant. It is reasonable to assume that other organic wastes from monochlorobenzene production were also placed in this unit. From 1972 to 1977 the site was used for disposal of

general plant debris such as paper, cardboard, wood, small metal containers, scrap plastic and rubber items from the entire plant. There are no records to indicate that the former landfill ever received any mercury sludges. The mercury sludges were managed in the weak brine pond. The landfill area is approximately 300 feet by 400 feet and is estimated to have an 8,000-cubic-yard capacity. In 1977, prior to RCRA, the landfill was closed with a clay cap, topsoil and grass as approved by the ADEM. The cap was upgraded in 1984 to address erosion problems that had occurred. During the upgrade, a 2-foot-thick layer of compacted clay and a 3- to 6-inch layer of topsoil was placed over the clay cap and the area was vegetated. A 3-foot-deep cutoff of recompacted clay was keyed into native clay around the entire perimeter of the landfill to limit leachate migration from the landfill.

Four soil borings will be completed in the landfill area through the residual waste material and underlying clay aquitard to approximately 10 to 20 feet into the underlying Alluvial Aquifer. The top of the Alluvial Aquifer is about 15 feet below ground surface in the area. Therefore, the estimated total depth from land surface for the planned borings is about 25 to 35 feet. A carbon steel casing will be installed at each boring location to encase the residual waste material and the upper portion of the underlying clay, preventing possible downward migration from potentially contaminated zones during drilling. The borings will be completed using hollow-stem auger methods. Due to the possibility of contacting unknown concentrations of potentially toxic materials, drilling activities will initially require Level B protection. The SSO may authorize a downgrade after air monitoring is conducted. Chloroform is the volatile chemical of primary concern and has a PEL of 2 ppm. Other chemicals potentially present include: thiadiazole, trichloroacetonitrile (TCAN) residue, sulfuric acid, chlorobenzene, benzene, hexchlorobenzene and dichlorobenzene isomers. The SSO will assess breathing air quality by using an OVA, and detector tubes for chloroform, sulfuric acid, and benzene.

#### Lime Ponds

Drilling will be conducted in the two lime ponds. These ponds were approximately the same size, but the west pond contained approximately 5,300 tons of lime waste and the east pond approximately 4,200 tons. The ponds contain lime (from the absorption and

3 8 1193

capture of residual chlorine gas) and lime sludges. These two ponds operated from 1968 to 1976 and were closed in 1979 (prior to RCRA) with a clay cap, topsoil and grass. One soil boring will be completed near the center of each of the two inactive lime ponds. Each boring will extend to the base of the lime waste. There may be potential for exposure to lime dust and mercury vapors; therefore, modified level D protection is required. The SSO will base levels of protection on the results of air monitoring and site conditions. A mercury vapor analyzer will be utilized to assess breathing zone air. Should dusty conditions arise, respirators with mercury vapor/HEPA or HEPA cartridges may be warranted.

#### Sanitary Landfills

Between 1977 and 1984, Olin operated two sanitary landfills that received general nonhazardous waste and plant refuse. Records show that waste disposed in these landfills included paper, glass, boxes, wood, plastic, grass clippings, pipe, concrete and sanitary sludge. The first unit was constructed in 1976 and operated from 1977 to 1978. It was approximately 150 feet by 200 feet and contained about 4,000 cubic yards of material. The second unit was operated from 1978 to 1984. The second unit was approximately 600 feet by 800 feet and contained about 18,000 cubic yards of material. The landfill operational plan indicates that the landfill cells were constructed 6 feet deep by 12 feet wide by 50 feet long. The two landfills were constructed adjacent to each other and there is no discernable boundary between them. Both units were closed in 1984 with a clay cap and vegetative cover under the State of Alabama solid waste management regulations that existed at the time of closure.

Three borings will be drilled at a randomly selected location from within the two landfills. The boring will be completed to the base of the waste. Based on Olin's records, the cells were constructed 6 feet deep. Therefore, the waste is anticipated to be within the upper 10 feet, which will be the maximum depth of the borings.

Although the waste streams are of varied origins overall, they are considered toxicologically nonhazardous. Air monitoring will be conducted with a mercury vapor analyzer and an OVA. Initially, Modified Level D protection is required. The SSO

will base levels of protection on the results of air monitoring. Physical hazards (debris) should be expected to be encountered during drilling.

#### Old Plant Landfill Drainage Ditch

During operations of the old plant (CPC) landfill as a wastewater neutralization unit, there was a drainage ditch to the wastewater ditch. The drainage ditch was unlined and has since been filled. The area has grown over with vegetation and there is no surficial evidence of the former ditch. The filling of the old plant landfill drainage ditch was conducted in conjunction with closure of the CPC landfill in 1977.

One shallow soil boring will be completed to a depth of approximately 10 feet at a location selected based on an aerial photograph review. This sample will be located as close to the current wastewater ditch as feasible, an area that may have been least disturbed by earthmoving activities.

Potential chemicals present are similar to those listed for the Old Plant Landfill. Modified Level D protection is required initially. Air monitoring will be conducted utilizing an OVA and chloroform detector tubes. The SSO will base levels of protection on the results of air monitoring.

#### Crop Protection Chemicals (CPC) Plant

This unit is the former location of the plant that was constructed in 1954 and initially manufactured monochlorobenzene and pentachloronitrobenzene (PCNB). In 1973, the plant was expanded to produce trichloroacetone nitrile (TCAN) and 5-ethoxy-3-trichloromethyl-1,2,4-thiadiazole (Terrazole®). The PCNB, TCAN and Terrazole® manufacturing areas were collectively referred to as the crop protection chemicals (CPC) plant. The CPC plant was shut down in 1982 for market economic reasons. In 1984, the plant area was decommissioned, dismantled and covered with an approximate 2-foot recompacted clay cap and topsoil. The capped area was then vegetated. The plan for decommissioning and dismantling the CPC plant area was approved by ADEM in 1983 and the work was completed in accordance with that plan.

In 1982, Soils and Materials Engineers (S&ME) investigated the clay soils beneath the former CPC plant area. Nineteen hand auger borings were completed to depths ranging from one foot to eight feet. S&ME analyzed the samples using a field screening method (portable gas chromatograph) and calculated "relative response" values. Five samples were also analyzed for chlorobenzene and benzene by an outside analytical laboratory. The maximum chlorobenzene concentration was 22.16 mg/kg from a sample collected at a depth of 4 feet. The maximum benzene concentration was 0.52 mg/kg from a sample collected at a depth of 5 feet. Based on knowledge of past operations of the facility, hexachlorobenzene is believed to be the most common organic constituent in the upper clay soils in the CPC plant area.

Two soil borings will be completed at the western and southern boundaries of the former CPC plant area. The soil borings will be advanced to a minimum of 10 feet into the underlying Alluvial Aquifer or until no elevated headspace measurements are recorded. The borings will not be advanced to a depth greater than 20 feet into the underlying aquifer. The borings will be completed using hollow-stem auger methods when drilling through the waste and underlying clay. A surface casing will be set into the clay before advancing to the Alluvial Aquifer.

The chemicals of concern include chloroform, dichlorobenzene isomers and hexachlorobenzene. Initially, modified Level D protection will be worn. Air monitoring will be conducted with an OVA and detector tubes for chloroform and benzene. The SSO will base levels of protection on the results of air monitoring.

#### Mercury Cell Plant

The former mercury cell plant is an area approximately 180 feet by 250 feet that was the site of the structures and operations for the former mercury cell chlor-alkali plant. The mercury drum storage pad, which has been clean-closed, and the mercury recovery systems were SWMUs located within the mercury plant area. The mercury waste pile storage pad, which also has been clean-closed, was located directly to the south of the mercury plant area. The mercury cell plant was shut down in 1982. The area was decommissioned and capped in 1986. Decommissioning included removal of all aboveground structures. The concrete pads and foundations were left in place and the



area was covered with asphalt. Decommissioning of the mercury cell plant, which was a process unit, was not subject to regulations of ADEM or EPA.

Six shallow soil borings will be completed at the former mercury cell plant area. The borings will be advanced to a depth of approximately 4 feet below the asphalt cover. If the borings encounter any concrete pads or foundations, the borings will be advanced approximately 4 feet below these pads/foundations. After breaking away the asphalt cover and concrete pad, the borings will be advanced by hollow-stem auger methods. One composite sample of the complete 4-foot interval will be obtained from each boring.

The chemical of concern is primarily mercury vapors; therefore, air monitoring will be conducted with a mercury vapor analyzer. Modified Level D protection is required initially. The SSO will base levels of protection on the results of air monitoring.

Since the concrete pads will be jackhammered with pneumatic tools additional PPE is mandatory such as full face shields, monogoggles, hearing protection and heavy leather gloves during the jackhammering procedure.

#### Well Sand Residue Area

Well sands were generated during the period from 1951 to 1968 from development and operation of the brine wells for the mercury cell chlor-alkali process. These sands are residues of the natural insoluble material from the salt domes. During early operation of the mercury cell plant, when the well sands were generated, they were deposited in mounds in an area referred to in the RFA as the well sand residue area. The well sand in these mounds is a cemented, granular material that has the consistency of sandstone. After 1968, Olin changed the method of removing brine from the salt dome cavities, leaving the residues in the cavity and thus eliminating their accumulation at the surface.

Samples will be collected at ten randomly selected areas and depths at the well sand residue area. The surface samples from the well sand residue area will be sampled

with stainless steel scoops, spoons, trowels, shovels, or slag hammer. The ten individual samples will be composited into one sample for analysis.

The chemical of concern is mercury vapors. Modified Level D protection will be worn initially. Due to the nature of this material, no air monitoring will be required. However, if dust is generated during sampling, the SSO may require respirators with HPEA cartridges.

#### Strong Brine Pond

The strong brine pond is a former process unit that was approximately 350 feet by 350 feet, and constructed partially above-grade in natural clay. The strong brine pond was a holding pond for the strong brine process fluid that was removed from the brine wells for use in the mercury cell plant. Removal of this process pond was conducted in 1985 by dewatering and scraping out the material in the pond. The material was then placed in the weak brine pond. The strong brine pond area was then graded flat, capped and vegetated. Two soil borings will be completed to a depth of 2 to 4 feet below the base of the pond into the natural soils. One sample of the natural soil from the base of each boring will be collected for analysis. The strong brine pond was a process unit for the mercury cell plant operations and therefore mercury is the potential constituent of concern. The borings will be completed using hollow-stem auger methods.

The chemical of concern is mercury vapors. Air monitoring will be conducted with a mercury vapor analyzer. The SSO will base levels of protection on the results of air monitoring. Modified Level D protection will be worn initially.

#### Clean Closure Equivalency

Four SWMUs that were clean closed under the requirements of 40 CFR 265 will also be sampled (the stormwater pond, the brine filter backwash pond, the pH pond and the mercury waste pile storage pad).

The stormwater pond was a clay-lined earthen structure approximately 100 feet by 365 feet and 11 feet deep (from the base to the top of the perimeter dike). When the pond was clean-closed in 1986, the 1.5-foot recompact clay liner was replaced. The pond currently is used as a standby stormwater retention pond and the integrity of the clay liner is maintained. The brine filter backwash pond was an earthen structure approximately 200 feet by 250 feet and 10 feet deep (from the base to the top of the perimeter dike). The brine filter backwash pond is lined with a synthetic membrane and is currently used as needed as nonhazardous surface impoundment. The pollution abatement (pH) pond was approximately 150 feet by 300 feet and 10 feet deep (from the base to the top of the perimeter dike). The bottom of this pond was constructed of a backfilled, low-permeability clay approximately 1.5 feet thick. The unit is now lined with a synthetic membrane and is used as a nonhazardous wastewater holding pond.

All three ponds are currently in active or standby nonhazardous service and have liners (either recompact clay or synthetic). Sampling directly through the ponds would make the ponds inoperable for a period of time and could compromise the integrity of the liners. Therefore, soil samples will be collected directly adjacent to the ponds. Two soil borings will be completed for each pond, one to the north and one to the south of the pond locations. These soil borings will be completed from either on top of the dikes or from the base of the dikes around the ponds, along the north-south centerline. The borings will be completed using hollow-stem auger methods. The borings will be advanced to 7 feet below the base of the pond (i.e., the base when it was an active hazardous waste unit). Two discrete samples will be obtained from each boring (one 2 feet and one 7 feet below the base of the pond). The samples will be obtained with either a split-spoon sampler or Shelby-tube sampler.

The mercury waste pile storage pad has been completely removed. The underlying concrete slab, which was cleaned during closure, remains at the location. One shallow boring will be completed through the center of the former waste pile area. The borings will be completed to a depth of approximately 4 feet below the concrete slab. One composite sample of the complete 4-foot interval will be obtained from the boring. After breaking or drilling a hole in the concrete slab, the boring will be advanced by

3 8 1199

hollow-stem auger methods. The samples will be collected with either a split-spoon or Shelby-tube sampler.

Contact with hazardous constituents is not expected; however, the SSO will still monitor breathing zones with an OVA and mercury vapor monitor. Initially, modified Level D protection will be worn. The SSO will base levels of protection on the results of air monitoring.

Jackhammering will require additional PPE such as full face shield, monogoggles, hearing protection and heavy leather gloves.

#### **4.2 Operable Unit 2**

The planned sampling for Operable Unit 2 consists of the following:

- Additional grab samples of the sediments in the basin flood plain
- Discrete samples from a core completed in the wastewater ditch
- A grab sediment sample from the Tombigbee River
- A background sediment sample to be analyzed for the selected list of TAL constituents
- A macroinvertebrate sample from a control area and approximately three macroinvertebrate samples from the basin.

Additional sampling will be conducted in the area beyond the boundaries of the basin in the basin flood plain and in the round pond to the north of the basin. The flood plain samples will be collected when the Tombigbee River is in a nonflood condition and will be collected with hand sampling tools. In addition, a grab sediment sample will also be collected from the Tombigbee River at the location where the discharge ditch enters the river. The submerged sediments will be collected from a boat with an Ekman dredge.

The vertical extent of contamination was not defined by the site characterization activities. The sample from the bottom interval (4- to 5-feet) at core location OD15 indicated mercury and hexachlorobenzene concentrations of 337 mg/kg and 560 mg/kg,

3 8 1200

respectively. Chlorobenzene was detected at 62 mg/kg in this 4- to 5-foot interval. An additional core will be completed at the OD15 location and sampled from 5 to 10 feet. This core will be completed by casing off the upper 5 feet of sediment and using a hand auger to advance into the underlying clay. The sample will be collected with drive-tube samplers or with the hand auger bucket.

The core work will be initially conducted in Level C protection with mercury vapor cartridges. The SSO will survey breathing zones with a mercury vapor monitor and downgrade if warranted.

A background sample will be collected during the Phase III sampling activities. Olin proposes to obtain the background sample beyond the boundaries of the Olin facility in an area of similar type sediments and geographical setting. The location of this sample has not yet been determined. Similarly, a macroinvertebrate sample will be obtained from this same area. The background sample and the macroinvertebrate sample will be collected using an Ekman dredge from a boat. During the Phase III sampling, approximately three additional macroinvertebrate samples will be collected from the basin, using the same procedures as the previous macroinvertebrate sampling (i.e., with an Ekman dredge from a boat).

Sediment sampling and macroinvertebrate sampling will be conducted in Level D protection as specified in the original plan and Addendum 1.

## **5.0 RESPONSIBLE PERSONNEL AND TRAINING**

Documentation of eight hours of Level B Training will be required of personnel performing Level B work. Personnel performing jackhammering and torch cutting will be experienced and apprised of associated hazards.

### **5.1 Project Director**

No change.

3 8 1201

**5.2 Project Manager**

No change.

**5.3 WCC Site Safety Officers**

Michael Schwartz, Fernando Sierra

**5.4 WCC Project Health and Safety Officer**

Alan T. Hall

**5.5 WCC Corporate Health and Safety Officer**

Charles W. Self

**6.0 HEALTH AND SAFETY HAZARD ASSESSMENT**

**6.1 General Hazards**

**6.1.1 Physical Hazards**

- Airborne pieces of concrete or asphalt associated with jackhammer
- Noise associated with jackhammering
- Corneal burns associated with cutting torches
- Fire hazard associated with use of cutting torches
- Drilling Hazards (Attachment 1)

Jackhammering concrete or asphalt activities create projectiles which could injure operators and/or bystanders. Pneumatic jacks will be utilized with the energy source positioned at a safe distance from any potentially flammable vapor sources. Bystanders shall not be allowed in the jackhammering vicinity. Jackhammer operators must wear full face shields and monogoggles, hearing protection, heavy leather gloves, and full

3 8 1202

body protection (i.e., heavy coveralls or tyvek, no shorts or short sleeves) in addition to the standard PPE (steel toed boots and hard hat).

Cutting with cutting torches creates light of such intensity and wavelength that thermal as well as corneal burns are potential hazards. Operators must wear cutting torch helmets with adequately tinted lenses and long sleeves and long pants to provide protection from the radiating heat. This work is to be performed in accordance with Olin's procedures for hot work and at a location free of flammables designed by Olin. The oxygen and acetylene bottles shall be properly labeled, secured, and stored.

#### **6.1.2 Biological Hazards**

No change.

#### **6.1.3 Chemical Hazards**

The old plant landfill may contain thiadiazole, trichloroacetonitrile, (TCAN) residue, sulfuric acid, chlorobenzene, dichlorobenzene, isomers, chloroform and hexachlorobenzene.

Overall, mercury and chloroform are of concern in much of this work.

Additional MSDS have been included in this addendum (Attachment 2).

#### **Level B Protective Equipment includes:**

- SCBA or supplied air full-face respirator operated in a pressure demand or other positive-pressure mode
- Chemical-resistant clothing; disposable tyvek or Olin approved equal. If conditions are wet the SSO may require coated tyvek.
- Gloves (outer) nitrile (inner) latex
- Boots chemical resistant steel toe and shank
- Hard hats
- Two-way, intrinsically-safe radio

3 8 1203

Level C Protective Equipment includes:

- Full face, air purifying respirators equipped with organic-vapor/HEPA or mercury vapor cartridges

**7.0 GENERAL HEALTH AND SAFETY REQUIREMENTS**

**7.1 Work Zones**

Level B work will require the demarcation of an exclusion zone, contamination reduction zone and a support zone.

**7.1.1 Site Drilling**

Before any drilling work is performed, an excavation permit will be obtained from Olin. In addition, available records will be consulted and used to evaluate the presence of underground structures.

During drilling activities in the Old Plant Landfill Area, the operator will be the only person allowed within the vicinity of the rig. Sampling personnel will be allowed to collect sample only after the drill bit has ceased operation. ALL PERSONNEL involved in drilling activities will be required to function in Level B gear. The basis for this level of protection is due to the potential for the landfill residue such as TCAN or acidic materials coming up the boring. Therefore, the rig operator must exercise extreme caution while advancing the boring both during sampling and auguring.

**7.2 Personal Protective Equipment (PPE) Provided and Required**

- Jackhammering-Basic PPE plus:
  - full face shield
  - monogoggles
  - hearing protection
  - heavy leather gloves
  - full body protection



- Torch cutting - Basic PPE plus: 3 8 1204
  - cutting goggles with No. 2 or No. 3 lens (minimum)
  - leather gauntlet gloves
  - full body protection
- Steam Cleaning - Basic PPE plus:
  - face shield
  - tyvek coveralls
  - full respiratory protection may be required based on air monitoring

### **7.3 Personnel Decontamination**

No change.

#### **7.3.1 Equipment Decontamination**

Gross contamination should be removed from drill rigs prior to moving the rig to an Olin designated decontamination pad. Efforts shall be made to keep cuttings clear of the drill rig.

A general equipment decontamination facility located away from the sampling areas will be constructed. Special care should be taken by operators to reduce the potential of spreading contaminated residue in transporting the equipment from the boring locations to the equipment decontamination area. The decontamination area will include:

- A polylined containment pad with the capability for collection of cleaning/rinsing wastewaters and decontamination debris
- Detergents, degreasers and solvents (low volatility, nonhalogenated variety)
- Manual cleaning equipment such as rags, brooms, mops and brushes

- Mechanical cleaning equipment such as high pressure water and steam cleaning equipment
- Disposal/containment drums and bags for containment of contaminated items and decontamination debris
- A holding area for decontaminated items awaiting the results of decontamination sampling and analysis, if needed prior to exiting the contaminated area

Cleaning/rinsing wastewaters, spent decontamination fluids, and contaminated debris generated by the decontamination operations will be disposed of or treated in an appropriate manner.

#### **7.4 Medical Examination**

No change.

#### **7.5 Compliance Agreement**

No change.

#### **7.6 Project Manager Notification**

No change.

#### **7.7 Prohibitions**

No change.

## **8.0 AIR QUALITY MONITORING**

### **8.1 Ambient or Area Monitoring**

WCC will conduct area monitoring during boring activities and grab sampling. This sampling will require monitoring for mercury vapors, chloroform, benzene, sulfuric acid, and organic vapors.

#### **8.1.1 Purpose and Scope**

No change.

#### **8.1.2 Monitoring During Work Activities**

##### **Old Plant (CPC) Landfill**

- OVA or HNu
- Mercury Vapor Analyzer
- Detector tubes for chloroform, sulfuric acid and benzene

##### **Lime Ponds**

- Mercury vapor analyzer

##### **Sanitary Landfill**

- HNu
- Mercury vapor analyzer

##### **Old Plant Landfill Drainage Ditch**

- OVA or HNu
- Mercury vapor analyzer
- Detector tubes for chloroform

3 8 1207

CPC Plant

- OVA or HNu
- Detector tubes for chloroform and benzene

Mercury Cell Plant

- Mercury Vapor Analyzer

Strong Brine Pond

- Mercury Vapor Analyzer

Mercury Cell Waste Pile Storage Area

- Mercury Vapor Analyzer

Clean Closed Ponds

- OVA or HNu
- Mercury Vapor Analyzer

Decontamination

- Air monitoring may also be required during decontamination of the drilling rig. The type and frequency of monitoring will be dependent on the results of monitoring at the site the drilling rig had been operated.

**8.1.3 Mercury Vapor Monitoring During Sediment Sampling Activities**

This will be performed core sampling activities.

**8.1.4 Frequency and Location**

3 8 1208

No change.

**8.2 Personnel Exposure Monitoring**

**8.2.1 Purpose and Scope**

No change.

**8.2.2 Procedure**

Reference to well sampling activities are to be replaced with boring and grab sampling activities. The HNu is to be replaced with or augmented with an OVA. Additional detector tubes are: chloroform and sulfuric acid with mercury vapor available as a back-up to the mercury vapor analyzer. Since mercury vapors are potential contaminants a Mercury Vapor Analyzer will be utilized. This piece of equipment is a direct reading instrument and will be used to determine ambient air concentrations of mercury vapors in the breathing zone of workers. (The breathing zone is an area approximately 1-foot sphere around a person's head.)

The decision to upgrade or downgrade will be made by the SSO based upon the readings obtained by the air monitoring equipment. Table 2 contains the air monitoring action levels.

**8.3 Responsibility/Authority**

No change.

**9.0 PERSONAL PROTECTIVE EQUIPMENT**

**9.1 Head Protection**

No change.

**9.2 Eye Protection**

3 8 1209

Jackhammering - full-face shield and monogoggles

Torch cutting - cutting goggles with a number 2 or number 3 lens as a minimum

**9.3 Skin Protection**

Full body protection for jackhammer and torch operators and steam-cleaning personnel.

**9.4 Respiratory Protection**

Level B - for initial work in the old plant (CPC) landfill

Level C - for coring work in the wastewater ditch

Level D - modified to include full body protection and gloves for all other waste related work unless directed otherwise by the SSO.

**9.5 Foot Protection**

No change.

**9.6 Hearing Protection**

No change.

**10.0 LABORATORY CONSIDERATIONS**

**10.1 Analytical Laboratory**

No change.

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**11.0 EMERGENCIES/ACCIDENTS**

WCC Physician - 504/751-0234

**12.0 EMERGENCY RESPONSE PLAN**

No change.

**13.0 PERSONNEL ASSIGNMENTS**

**13.1 Project Personnel**

Project Health/Safety Officer: Alan T. Hall

SSO: Michael Schwartz, Fernando Sierra

WCC Drilling Crew: Jody Davis, Mark Pepper

Corporate Health and Safety Officer: Charles W. Self

WCC Subcontract Drillers: Layne Environmental Personnel

**13.2 Project Safety Personnel**

No change.

**14.0 SAFETY PLAN APPROVAL**

See Section 1.1 of this addendum.

**Woodward-Clyde  
Consultants**

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**15.0 SAFETY PLAN COMPLIANCE AGREEMENT**

I, \_\_\_\_\_ (print name), have reviewed a copy of the original Health and Safety Plan, WCC Project Number 90B449C, and Addendum 90B449C Task 3F for the Remedial Investigation/Feasibility Study at the Olin McIntosh Facility. I understand it and agree to comply with all provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the documents.

Signed:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Date)

Firm: \_\_\_\_\_



# ADDENDUM TO TABLE 1

## CONTAMINANTS POTENTIALLY PRESENT IN SOILS OR SEDIMENTS

Chemical Name	Description	Exposure Limits	IDLH	Hazard/Effects of Exposure
Sulfuric Acid	Colorless to dark-brown, odorless liquid	OSHA-PEL-TWA 1 mg/m <sup>3</sup> (.245 ppm) ACGIH-TLV 1 mg/m <sup>3</sup> (.245 ppm)	80 mg/m <sup>3</sup> (19 ppm)	Poison. Moderately toxic by inhalation. Corrosive irritant to skin, eyes, and mucous membranes. Exposure causes severe burns and possible pulmonary damage.
Trichloroacetonitrile	Colorless to pale liquid	Not established	Not established	Skin irritation. Severe eye and mucous membrane irritation. May cause respiratory irritation.
Thiadizole	Reddish-brown liquid with musty odor	Not established	Not established	Slight skin, eye and mucous membrane irritation.

**Woodward-Clyde  
Consultants**

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08-06-92

# Woodward-Clyde Consultants

TABLE 2

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## AIR MONITORING ACTION LEVELS FOR SUSPECTED AIRBORNE CONTAMINANTS

Contaminant	Instrument	Instrument Reading <sup>1</sup>	Action Taken
Benzene	Detector Tube	0 - .5 ppm <sup>2</sup>	Continue work in Modified Level D
		> .5 - 50 ppm	Upgrade to Level C Full-Face APR (with organic vapor cartridges) expand work zones, and implement use of organic vapor badges
		> 50 - 100 ppm	Evacuate area or upgrade to Level B. Continue use of organic vapor badges.
Chloroform	Detector Tube	0 - 2 ppm	Continue work in modified Level D
		> 2 - 5 ppm	Upgrade to Level C - Full face APR with acid gas cartridges, expand work zones, and implement use of organic vapor badges or evacuate
		> 5 ppm - 50	Level B, continue use of organic vapor badges or evacuate
		> 50 ppm	Evacuate
Organic Vapors	HNu (11.7 probe) or equivalent i.e., organic vapor analyzer (OVA)	0 - 50 ppm	Continue work in Modified Level D
		> 50 - 250 ppm	Upgrade to Level C Full-Face APR (with organic vapor cartridges) expand work zones and implement use of organic vapor badges
		> 250 ppm - 500 ppm	Evacuate area or upgrade to Level B. Continue use of organic vapor badges.

**TABLE 2 (Continued)**

**AIR MONITORING ACTION LEVELS FOR  
SUSPECTED AIRBORNE CONTAMINANTS**

Contaminant	Instrument	Instrument Reading <sup>1</sup>	Action Taken
Mercury Vapors	Detector Tube or Mercury Vapor Monitor	Background - .02 mg/m <sup>3</sup>	Modified Level D
		> .02 - .25 mg/m <sup>3</sup>	Implement Level C Full-Face APR (with mercury vapor cartridges) and use of mercury vapor badges or Evacuate
		> .25 - 20 mg/m <sup>3</sup>	Evacuate or Level B. Continue use of mercury badges.
Sulfuric Acid	Detector Tube	> 20 mg/m <sup>3</sup>	Evacuate.
		0 - 1 mg/m	Continue working in Modified Level D
		> 1 - 5 ppm	Upgrade to Level C - Full face APR with acid gas cartridges, expand work zones, or evacuate
		> 5 - 15 ppm	Level B or evacuate.
		> 15 ppm	Evacuate.

**NOTES:**

<sup>1</sup> Sustained readings (approximately 15 minutes of consistent readings) in breathing zone, (i.e., 1-foot sphere around a person's head).

<sup>2</sup> Two consecutive readings taken 15 minutes apart.

**Woodward-Clyde  
Consultants**

3 8 1215

**ATTACHMENT 1**

**MATERIAL SAFETY DATA SHEETS**



OCEAN® Network

EMERGENCY PHONE 1-800-OLIN-911

# MATERIAL SAFETY DATA

3 8 1216

## SECTION I - IDENTIFICATION

MSDS FILE 550

<b>CHEMICAL NAME &amp; SYNONYMS</b> 5-ethoxy-2-(trichloromethyl)-1,2,4-thiadiazole		
<b>CHEMICAL FAMILY</b> Thiadiazole	<b>FORMULA</b> $C_6H_5Cl_3N_2OS$	<b>PRODUCT</b> Terrazole Technical
<b>DESCRIPTION</b> Reddish-brown liquid with musty odor		<b>GAS NO.</b> 2803-15-9

## SECTION II - NORMAL HANDLING PROCEDURES

<b>PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE</b> Avoid contact with eyes, skin or clothing. Do not take internally. Upon contact with skin or eyes, wash off with water. Avoid breathing mist or vapor. Store in a cool, dry, well-ventilated place. Do not allow to freeze.	
<b>PROTECTIVE EQUIPMENT</b>	<b>VENTILATION REQUIREMENTS</b>
<b>EYES</b> Goggles <b>GLOVES</b> Impervious <b>FEET</b> Coveralls and boots	Local mechanical exhaust ventilation recommended to minimize employee exposure.

## SECTION III - HAZARDOUS INGREDIENTS

BASIC MATERIAL	OSHA PEL	LD50	LC50	SIGNIFICANT EFFECTS
Terrazole Technical	None established	1.08 g/kg (rat)	>200 mg/L 1 hr (rat)	Slight skin, eye and mucous membrane irritation

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

<b>FLASH POINT</b> >200°F COC <b>METHOD</b>	<b>OSHA CLASSIFICATION</b> Slightly combustible liquid	<b>FLAMMABLE EXPLOSIVE LIMIT</b>	<b>LOWER</b> NO	<b>UPPER</b> NO
<b>EXTINGUISHING MEDIA</b> Water spray, dry chemical				
<b>SPECIAL FIRE HAZARD &amp; FIRE FIGHTING PROCEDURES</b> Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus when any material is involved in a fire.				

## SECTION V - HEALTH HAZARD DATA

<b>THRESHOLD LIMIT VALUE</b> None established
<b>SYMPTOMS OF OVER EXPOSURE</b> Slight skin, eye and mucous membrane irritation.
<b>EMERGENCY FIRST-AID PROCEDURES</b>
<b>SKIN</b> Flush with water for 15 minutes. Call a physician.
<b>EYES</b> Flush with water for 15 minutes. Call a physician.
<b>INGESTION</b> Drink large quantities of water. Induce vomiting by sticking finger down throat. Call a physician.
<b>INHALATION</b> Remove victim to fresh air. Call a physician.

3 8 1217

PRODUCT CODE 801600CHEMICAL NAME Terrazole Technical**SECTION VI - TOXICOLOGY (PRODUCT)**

ACUTE ORAL LD 50  
1.08 g/kg (rat)  
ACUTE DERMAL LD 50  
1.97 g/kg (rat)  
ACUTE INHALATION LC 50  
>200 mg/L 1 hr (rat)

CARCINOGENICITY Not known to be carcinogenic  
MUTAGENICITY Not known to be mutagenic  
EYE IRRITATION Slight irritant  
PRIMARY SKIN IRRITATION  
Slight irritant

PRINCIPAL ROUTES OF ABSORPTION  
Inhalation, dermal

EFFECTS OF ACUTE EXPOSURE  
Slight skin, eye and mucous membrane irritation, lethargy, diarrhea

EFFECTS OF CHRONIC EXPOSURE  
May cause liver damage

**SECTION VII - SPILL AND LEAKAGE PROCEDURES (CONTROL PROCEDURES)****ACTION FOR MATERIAL RELEASE OR SPILL**

Wear NIOSH/MSHA approved organic vapor/mist respirator. Follow OSHA regulations for respirator use (see 29 CFR 1910.134). Wear goggles, coveralls, impervious gloves and boots. Isolate area of spill by diking. Stop source of leak. Transfer contents to non-leaking container or storage vessel. Add dry absorbent. Clean up and place in an approved DOT container and seal. Wash all contaminated clothing before reuse. In the event of a large spill, call the emergency telephone number shown on the front of this sheet.

**TRANSPORTATION EMERGENCY, CONTACT CHEMTREC 800-424-9300**

Dispose of contaminated product, empty containers and materials used in cleaning up spills or leaks in a manner approved for this material. Consult appropriate federal, state and local regulatory agencies to ascertain proper disposal procedures.

**SECTION VIII - SHIPPING DATA**

D.O.T. No data

**SECTION IX - REACTIVITY DATA**

STABLE X UNSTABLE AT \_\_\_\_\_ C \_\_\_\_\_ F

HAZARDOUS  
POLYMERIZATIONWILL NOT REACT  
X**CONDITIONS TO AVOID**

Extreme heat  
INCOMPATIBILITY (MATERIAL TO AVOID)  
Strong oxidizing agents, acids, bases  
HAZARDOUS DECOMPOSITION PRODUCTS  
Hydrogen chloride, oxides of sulfur and nitrogen

**SECTION X - PHYSICAL DATA**

MELTING POINT 82°F

VAPOR PRESSURE 0.1 mmHg

VOLATILES Low

BOILING POINT 209°F

SOLUBILITY IN WATER Insoluble

EVAPORATION RATE No data

SPECIFIC GRAVITY (H<sub>2</sub>O=1) 1.80

PH 3-4

VAPOR DENSITY (AIR=1) No data

INFORMATION: FURNISHED TO

FURNISHED BY DATE DECEMBER 7, 1988

Olin MSDS Control Group  
(203) 866-8448

ATTN: DEPT HANDLING MATL SAFETY DATA SHEETS  
OLIN CORPORATION  
MSDS CONTROL GROUP  
2-8  
SPECIAL PRINT

**Olin CORPORATION**  
120 Long Ridge Road, Stamford, Connecticut 06904  
OCEAN® Network  
EMERGENCY PHONE 1-800-OLIN-811

/ITCHF  
RIG

3 8 1218

TO: KATHIE SULLIVAN  
PER JACKIE REED'S  
INSTRUCTION  
MCINTOSH AL XXXXX

PAGE 01 OF 09

OLIN CORPORATION  
Material Safety Data Sheet

07/18/92

\*\*\* APPROVED MSDS WORKING COPY \*\*\*  
\*\*\* APPROVED MSDS WORKING COPY \*\*\*  
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Product Name: TRICHLOROACETONITRILE  
Product Code: CPE904715  
MSDS Number : CPE00700.0001

OCEAN NETWORK EMERGENCY PHONE 1-800-OLIN-911

This material safety data sheet 'MSDS' has been prepared in compliance with the federal OSHA Hazard Communication Standard, 29 CFR 1910.1200. This product is considered to be a hazardous chemical under that standard. This information is required to be disclosed for safety in the workplace. The exposure to the community, if any, is quite different.

## I. PRODUCT IDENTIFICATION

REVISION NUMBER : 04  
REVISION DATE : 01/23/91  
MSDS FILE NUMBER: CPE00700.0001  
PRODUCT CODE : 904715  
MGDS NAME : TRICHLOROACETONITRILE

SYNONYMS: TCAN  
CHEMICAL FAMILY: Nitrile  
FORMULA: C\2Cl\3N  
USE DESCRIPTION: Chemical intermediate  
OSHA HAZARD CLASSIFICATION: Corrosive to eyes; skin irritant; lung toxin; toxic

## II. COMPONENT-DATA

PRODUCT COMPOSITION

## TRICHLOROACETONITRILE

CPE904715

PAGE 2

CAS or CHEMICAL NAME: Trichloroacetonitrile

CAS NUMBER: 545-08-2

PERCENTAGE RANGE: 99-100%

HAZARDOUS PER 29 CFR 1910.1200: Yes

EXPOSURE STANDARDS: None Established

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## III. SAFE HANDLING AND STORAGE

DO NOT TAKE INTERNALLY. AVOID CONTACT WITH SKIN, EYES AND CLOTHING. UPON CONTACT WITH SKIN OR EYES, WASH OFF WITH WATER.

## STORAGE CONDITIONS:

DO NOT STORE AT TEMPERATURES ABOVE: 95 Deg.C (95 Deg.F)

## PRODUCT STABILITY AND COMPATIBILITY

SHELF LIFE LIMITATIONS: One year if stored under cool, dry conditions

INCOMPATIBLE MATERIALS FOR PACKAGING: Ferrous metals

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: Water, strong acid, strong alkali, oxidizing agents

## IV. PHYSICAL DATA

APPEARANCE: Colorless to pale yellow liquid

FREEZING POINT: -42 Deg.C (-44 Deg.F)

BOILING POINT: 86-88 Deg.C (185-187 Deg.F)

DECOMPOSITION TEMPERATURE: No Data

SPECIFIC GRAVITY: 1.44

BULK DENSITY: 1.44 (g/cc)

pH @ 25 DEG.C: Not Applicable (Gradually releases acid when mixed with water)

VAPOR PRESSURE: 00 mm at 20 Deg.C

SOLUBILITY IN WATER: Less than 1 g/l

VOLATILES, PERCENT BY VOLUME: 99.5 min.

EVAPORATION RATE: &gt; 1 (water=1)

VAPOR DENSITY: No Data

MOLECULAR WEIGHT: 144.38

ODOR: Strong, acrid, irritating

COEFFICIENT OF OIL/WATER DISTRIBUTION: No Data

## V. PERSONAL PROTECTIVE EQUIP

## PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT:

RESPIRATORY PROTECTION: Wear a NIOSH/MSHA approved respirator if any exposure occurs.

VENTILATION: Use local exhaust ventilation.

SKIN AND EYE PROTECTIVE EQUIPMENT: Wear gloves, boots, apron and a face shield with safety glasses. A full impermeable suit is recommended if exposure is possible to large portion of body.

OTHER: Emergency eye wash and safety showers must be provided in the immediate work area.

## EQUIPMENT SPECIFICATIONS (WHEN APPLICABLE):

RESPIRATOR TYPE: NIOSH/MSHA approved positive-pressure supplied-air respirator

PROTECTIVE CLOTHING TYPE (This includes: gloves, boots, apron, protective suit): Impervious



**TRICHLOROACETONITRILE**

**CPE904715**

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**VI. FIRE & EXPLOSION HAZARDS**

3 8 1220

**FLAMMABILITY DATA:**

FLAMMABLE: No  
COMBUSTIBLE: No  
PYROPHORIC: No

FLASH POINT: > 185 DEG.C (> 383 DEG.F) Test Method: Tag open cup

AUTOIGNITION TEMPERATURE: No Data

FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT VOLUME IN AIR): LEL - No Data UEL - No Data

NFPA RATINGS: Not Established

**HMIS RATINGS:**

Health: 3  
Flammability: 1  
Reactivity: 1

EXTINGUISHING MEDIA: Alcohol foam, carbon dioxide, dry chemical

FIRE FIGHTING TECHNIQUES AND COMMENTS: Water reactive material; do not spray with water, will form hydrochloric acid. See Section XI for protective equipment for fire fighting.

**VII. REACTIVITY**

**CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:**

TEMPERATURES ABOVE: Stable up to at least 85 Deg.C (185 Deg.F)

MECHANICAL SHOCK OR IMPACT: No

ELECTRICAL (STATIC) DISCHARGE: No

HAZARDOUS POLYMERIZATION: Will not occur

INCOMPATIBLE MATERIALS: Water, strong acids, strong alkali, oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine, hydrogen chloride, carbon dioxide, carbon monoxide, nitrogen oxides

**SUMMARY OF REACTIVITY:**

OXIDIZER: No  
PYROPHORIC: No  
ORGANIC PEROXIDE: No  
WATER REACTIVE: No  
OTHER: Hydrolyzes slowly when mixed with water forming hydrochloric acid

**VIII. FIRST AID**

EYES: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

SKIN: Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, the clothing should be removed immediately and should be laundered before re-use.

INGESTION: Immediately drink large quantities of water. Induce vomiting. Call a physician at once. DO NOT give anything by mouth if

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RICHLOROACETONITRILE

CPFA04715

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the person is unconscious or if having convulsions.

**INHALATION:** If person experiences nausea, headache or dizziness, person should stop work immediately and move to fresh air until these symptoms disappear. If breathing is difficult, administer oxygen, keep the person warm and at rest. Call a physician. In the event that an individual inhales enough vapor to lose consciousness, person should be moved to fresh air at once and a physician should be called immediately. If breathing has stopped, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before the person returns to work.

#### IX. TOXICOLOGY & HEALTH

##### ROUTES OF ABSORPTION

Inhalation, ingestion, skin and eye contact

##### WARNING STATEMENTS AND WARNING PROPERTIES

DO NOT TAKE INTERNALLY. CAUSES SKIN IRRITATION. CAUSES SEVERE EYE AND MUCOUS MEMBRANE IRRITATION. HARMFUL IF SWALLOWED. MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN. MAY BE HARMFUL IF INHALED. MAY CAUSE RESPIRATORY IRRITATION.

##### HUMAN THRESHOLD RESPONSE DATA

**ODOR THRESHOLD:** No available data. Acetonitrile odor threshold is 170 ppm.

**IRRITATION THRESHOLD:** No available data

**IMMEDIATELY DANGEROUS TO LIFE OR HEALTH:** The IDLH concentration has not been established for this product.

##### SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE

###### INHALATION

###### ACUTE:

May be harmful if inhaled. Inhalation of this material would be irritating to the nose, mouth, throat and lungs. It may also cause burns to the respiratory tract with the production of lung edema which can result in shortness of breath, wheezing, choking, chest pain and impairment of lung function.

###### CHRONIC:

Chronic (repeated) inhalation exposure may cause impairment of lung function and permanent lung damage.

###### SKIN

###### ACUTE:

May be harmful if absorbed through the skin. Skin contact would be expected to cause irritation consisting of transient redness. This irritant effect would not be expected to result in permanent damage.

###### CHRONIC:

There are no known or reported effects from chronic exposure except for those similar from single exposures.

###### EYE

Severe irritation and/or burns can occur following eye contact. Contact may cause impairment of vision and corneal damage.

###### INGESTION

**RICHLOROACETONITRILE**

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**ACUTE:**

Harmful if swallowed. Irritation and/or burns may occur to the entire gastrointestinal tract, including the stomach characterized by nausea, vomiting, lethargy, diarrhea, abdominal pain, bleeding and/or tissue ulceration.

**CHRONIC:**

There are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

None known or reported

**INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY**

None known or reported

**ANIMAL TOXICOLOGY**

**ACUTE TOXICITY:**

Inhalation LC 50: > 125 ppm for 4 hrs(rat). May be harmful if inhaled.

Dermal LD 50: 900 mg/kg (rabbit). Harmful if absorbed through the skin.

Oral LD 50: 250 mg/kg (rat). Harmful if swallowed.

Irritation: Irritant to skin and eyes. May cause respiratory irritation.

**ACUTE TARGET ORGAN TOXICITY:**

Contact with the eyes and mucous membranes can result in severe irritation. Contact with the skin can cause irritation. If inhaled, irritation to the upper respiratory tract, mucous membranes and lungs can occur.

**CHRONIC TARGET ORGAN TOXICITY:**

There are no known or reported effects from repeated exposure.

**REPRODUCTIVE AND DEVELOPMENTAL TOXICITY:**

Trichloroacetonitrile (TCAN) was tested in laboratory animals for reproductive and developmental effects. At doses that caused maternal toxicity, TCAN was fetotoxic. Animals exposed to TCAN by inhalation to extremely high concentrations (1,800 and 8,000 ppm), were observed to have an increase in skeletal abnormalities.

**CARCINOGENICITY:**

This product is not known or reported to be carcinogenic by IARC, OSHA, or NTP.

TCAN was administered for eight weeks to laboratory animals and was found to significantly increase the number of lung adenomas. However, while this finding was significant, the strain of animals tested were found to have a high degree of variation for lung adenomas.

**MUTAGENICITY:**

TCAN has been shown to be weakly mutagenic when tested in bacterial strains TA100 and TA98 with and without bioactivation. TCAN was shown to increase sister chromatid exchange (SCE).

**AQUATIC TOXICITY:**

LC 50 96 hr. Fathead minnow: 0.54 mg/l

LC 50 24 & 48 hr. Fathead minnow: 0.68 mg/l

**X. TRANSPORTATION**

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TRICHLOROACETONITRILE

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THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101.  
IRRITATING AGENT N.O.S. (TRICHLOROACETONITRILE) NA 1893

REPORTABLE QUANTITY: Not Applicable (Per 49 CFR 172.101, Appendix)

The material described above is subject to the U.S. DOT HAZARDOUS MATERIALS REGULATIONS via the modes and packaging quantities indicated below with the letter "x":

MODE	PACKAGING QUANTITIES	
<input checked="" type="checkbox"/> Rail	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Motor	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Water	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk

The applicable packaging section in 49 CFR is 173.382.

#### XI. SPILL & LEAKAGE

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

REPORTABLE QUANTITY: Not Applicable (Per 40 CFR 302.4)

#### SPILL MITIGATION PROCEDURES:

Evacuation procedures must be planned into effort. Evacuate all non essential personnel. Hazardous concentrations in air may be found in local spill area and immediately downwind. Remove all sources of ignition. Stop movement of until all downwind personnel and notify appropriate personnel.

AIR RELEASE: Vapors may be suppressed by the use of water fog but will slowly release hydrochloric acid. Contain all liquid for treatment and/or disposal as a potential hazardous waste.

WATER RELEASE: This material is heavier than water and insoluble in water. Notify all downstream users of possible contamination. Divert water flow around spill if possible and safe to do so. If unable to divert, create an overflow dam to contain material. Continue to handle as described in land spill.

LAND SPILL: Create a dike or trench to contain materials. Spill materials may be absorbed using sand, clay or non-combustible absorbent. Do not place spill materials back in their original containers. Containerize and label all spill materials properly. Decontaminate all clothing and the spill area using soap solution and flush with large amounts of water.

#### SPILL RESIDUES:

Dispose of per guidelines under Section XII, WASTE DISPOSAL.

#### PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS:

Additional respiratory protection is necessary when a spill or fire involving this product occurs. You are recommended to use a full face

## DICHLOROACETONITRILE

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NIOSH/MSHA approved positive-pressure supplied-air respirator.

Additional protective clothing must be worn to prevent personal contact with this material. Those items include but are not limited to: impervious clothing, i.e., chemically impermeable suit

## XII. WASTE DISPOSAL

If this product becomes a waste, it DOES NOT meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D.

As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations by incineration.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

## XIII. ADDITIONAL REG STATUS

## TOXIC SUBSTANCES CONTROL ACT:

The reportable components of this product are listed on the Toxic Substances Control Act inventory.

## SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT TITLE III:

HAZARD CATEGORIES, PER 40 CFR 370.2:

## HEALTH:

Immediate (Acute)

## PHYSICAL:

None

## EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:

EXTREMELY HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:

None Established

SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:

None Established

## XIV. ADDITIONAL INFORMATION

No Additional Information

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41(5), 543, May 1990.

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. THIS INFORMATION HAS BEEN PREPARED FOR THE GUIDANCE OF PLANT ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT. OLIN BELIEVES THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF THE DATE OF PUBLICATION, BUT MAKES NO WARRANTY THAT IT IS. ADDITIONALLY, IF THIS MATERIAL SAFETY DATA SHEET IS MORE THAN THREE YEARS OLD, YOU SHOULD CONTACT OLIN AT THE PHONE NUMBER LISTED BELOW TO MAKE CERTAIN THAT THIS SHEET IS CURRENT.

OLIN MSDS CONTROL GROUP

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SWITCHF  
ORIG

TO: CATHIE SULLIVAN  
OLIN CORPORATION  
MCINTOSH AL

PAGE 01 OF 06

OLIN CORPORATION  
Material Safety Data Sheet

07/29/92

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Product Name: **SULFURIC ACID SOLUTION**  
Product Code: CPE877055  
MSDS Number : CPE00049.0072

OCEAN NETWORK EMERGENCY PHONE 1-800-OLIN-911

This material safety data sheet 'MSDS' has been prepared in compliance with the federal OSHA Hazard Communication Standard. 29 CFR 1910.1200. This product is considered to be a hazardous chemical under that standard. This information is required to be disclosed for safety in the workplace. The exposure to the community, if any, is quite different.

I. PRODUCT IDENTIFICATION

REVISION NUMBER : 08  
REVISION DATE : 01/01/92  
MSDS FILE NUMBER: CPE00049.0072  
PRODUCT CODE : 877055  
MSDS NAME : SULFURIC ACID SOLUTION

SYNONYMS: Oil of vitriol, Dipping acid  
CHEMICAL FAMILY: Inorganic acid  
FORMULA:  $H_2SO_4$   
DESCRIPTION: Acid

OSHA HAZARD CLASSIFICATION: Irritant or corrosive hazard to skin, eyes, or lungs; highly toxic by inhalation; water reactive

II. COMPONENT-DATA

PRODUCT COMPOSITION



**SULFURIC ACID SOLUTION**

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CAS or CHEMICAL NAME: Sulfuric acid  
 CAS NUMBER: 7664-93-9  
 PERCENTAGE RANGE: 20-100%  
 HAZARDOUS PER 29 CFR 1910.1200: Yes  
 EXPOSURE STANDARDS:

	OSHA(PEL)	ACGIH(TLV)
	ppm mg/oubio motor	ppm mg/oubio motor
TWA:	1	1
CEILING:	None	None
STEL:	None	None

CAS or CHEMICAL NAME: Water  
 CAS NUMBER: 7732-18-5  
 PERCENTAGE RANGE: 0-80%  
 HAZARDOUS PER 29 CFR 1910.1200: No  
 EXPOSURE STANDARDS: None established

**III. SAFE HANDLING AND STORAGE**

DO NOT TAKE INTERNALLY. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. UPON CONTACT WITH SKIN OR EYES, WAS OFF WITH WATER.

STORAGE CONDITIONS: Store in a cool, dry, well-ventilated place.

DO NOT STORE AT TEMPERATURES ABOVE: Normal storage temperatures are satisfactory

**PRODUCT STABILITY AND COMPATIBILITY**

SHELF LIFE LIMITATIONS: 1 Year - glass, 8 Months - polyethylene

INCOMPATIBLE MATERIALS FOR PACKAGING: Glass containers are satisfactory

INCOMPATIBLE MATERIALS FOR STORAGE OR TRANSPORT: Refer to Incompatible materials in Section VII.

**IV. PHYSICAL DATA**

APPEARANCE: Clear, colorless liquid

FREEZING POINT: <11 Deg.C (52 Deg.F)

BOILING POINT: Approximately 105 Deg.C (221 Deg.F) 20% Sulfuric acid  
 Approximately 275-325 deg.C (527-617) - 90-100% Sulfuric acid

DECOMPOSITION TEMPERATURE: 340 Deg.C (644 Deg.F)

SPECIFIC GRAVITY: Approximately 1.16 (20%) to 1.84(98%)

BULK DENSITY: Not applicable

pH @ 25 DEG.C: <1 (1% solution)

VAPOR PRESSURE @ 25 DEG.C: Very low

SOLUBILITY IN WATER: Complete

VOLATILES, PERCENT BY VOLUME: No Data

EVAPORATION RATE: No Data

VAPOR DENSITY: No Data

MOLECULAR WEIGHT: 98.08 (active ingredient)

ODOR: None

COEFFICIENT OF OIL/WATER DISTRIBUTION: No Data

**V. PERSONAL PROTECTIVE EQUIP****PERSONAL PROTECTION FOR ROUTINE USE OF PRODUCT:**

RESPIRATORY PROTECTION: Wear a NIOSH/MSHA approved respirator if any exposure occurs.

VENTILATION: Use local exhaust ventilation to maintain levels to below the TLV.

SKIN PROTECTIVE EQUIPMENT: Wear gloves, boots, apron and a face shield

**SULFURIC ACID SOLUTION**

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with safety glasses. A full impermeable suit is recommended if exposure is possible to large portion of body.

**EQUIPMENT SPECIFICATIONS:**

**RESPIRATOR TYPE:** Wear a NIOSH/MSHA approved full-face respirator with an acid gas cartridge and a dust/mist pre-filter.

**GLOVE TYPE:** Neoprene or PVC

**BOOT TYPE:** Neoprene or PVC

**APRON TYPE:** Neoprene or PVC

**PROTECTIVE SUIT:** Impervious

**OTHER:** Emergency shower/eyewash station

**VI. FIRE & EXPLOSION HAZARDS****FLAMMABILITY DATA:****FLAMMABLE:** No**COMBUSTIBLE:** No**PYROPHORIC:** No**FLASH POINT:** None**AUTOIGNITION TEMPERATURE:** Not Applicable

**FLAMMABLE LIMITS AT NORMAL ATMOSPHERIC TEMPERATURE AND PRESSURE (PERCENT VOLUME IN AIR):** LEL- Not Applicable UEL- Not Applicable

**NFPA RATINGS:**

**Health:** 3

**Flammability:** 0

**Reactivity:** 2

**Special Hazard Warning:** NO WATER (WATER REACTIVE)

**HMIS RATINGS:**

**Health:** 3

**Flammability:** 0

**Reactivity:** 2

**EXTINGUISHING MEDIA:** Not Applicable

**FIRE FIGHTING TECHNIQUES AND COMMENTS:** Use water to cool containers exposed to fire. Use extreme caution, see below. Water reactive material; do not spray with water. Contact with reactive metals, e.g., aluminum may result in the generation of flammable hydrogen gas. See Section XI for protective equipment for fire fighting. Reacts violently with water and organic materials with evolution of heat. See Section VII. Fires involving small amounts of combustibles may be smothered with suitable dry chemical. Use water on combustibles burning in the vicinity of this material, but use extreme caution when applying water to cool containers. DO NOT LET WATER COME IN CONTACT WITH THIS ACID. EVOLUTION OF HEAT AND SPLATTERING WILL RESULT.

**VII. REACTIVITY****CONDITIONS UNDER WHICH THIS PRODUCT MAY BE UNSTABLE:****TEMPERATURES ABOVE:** 250 Deg.C (482 Deg.F)**MECHANICAL SHOCK OR IMPACT:** No**ELECTRICAL (STATIC) DISCHARGE:** No**HAZARDOUS POLYMERIZATION:** Will Not Occur

**INCOMPATIBLE MATERIALS:** Alkalies, amines, anhydrides, combustibles, organics, oxidizers, powdered metals

**HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen gas by reaction with metals, sulfur trioxide

**OTHER CONDITIONS TO AVOID:** Water, heat

**SULFURIC ACID SOLUTION****CPE877055****PAGE 4****SUMMARY OF REACTIVITY:**

**OXIDIZER:** No  
**PYROPHORIC:** No  
**ORGANIC PEROXIDE:** No  
**WATER REACTIVE:** Yes  
**CORROSIVE:** Yes

**VIII. FIRST AID**

**EYES:** Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

**SKIN:** Immediately flush with water for at least 15 minutes. Call a physician. If clothing comes in contact with the product, the clothing should be removed immediately and should be laundered before re-use.

**INGESTION:** Immediately drink large quantities of water. DO NOT induce vomiting. Call a physician at once. DO NOT give anything by mouth if the person is unconscious or if having convulsions.

**INHALATION:** If person experiences nausea, headache or dizziness, person should stop work immediately and move to fresh air until these symptoms disappear. If breathing is difficult, administer oxygen, keep the person warm and at rest. Call a physician. In the event that an individual inhales enough vapor to lose consciousness, person should be moved to fresh air at once and a physician should be called immediately. If breathing has stopped, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before the person returns to work.

**IX. TOXICOLOGY & HEALTH****ROUTES OF ABSORPTION**

Inhalation, Skin, Eye, Ingestion

**WARNING STATEMENTS AND WARNING PROPERTIES**

**MAY BE FATAL IF INGESTED.**

**HARMFUL IF INHALED OR EXPOSED TO SKIN OR EYES.**

**HUMAN THRESHOLD RESPONSE DATA**

**ODOR THRESHOLD:** There is no data for odor threshold.

**IRRITATION THRESHOLD:** There is no data for irritation threshold.

**IMMEDIATELY DANGEROUS TO LIFE AND HEALTH:** The IDLH concentration is 80 mg/cubic-meter.

**SIGNS, SYMPTOMS, AND EFFECTS OF EXPOSURE****INHALATION:**

**ACUTE:** Inhalation of this material is irritating to the nose, mouth, throat, and lungs. It may also cause burns to the respiratory tract with the production of lung edema which can result in shortness of breath, wheezing, choking, chest pain, and impairment of lung function. Inhalation of high concentrations may result in permanent lung damage.

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**CHRONIC:** Repeated inhalation exposure may cause bronchitis, impairment of lung function and permanent lung damage with epithelial hyperplasia and thickening of the bronchiolar walls. Inhalation of mist may also produce etching of the dental enamel followed by erosion of the enamel and dentine with loss of tooth substance.

**EYE:**

Severe irritation and/or burns can occur following eye exposure. Contact may cause impairment of vision and corneal damage.

**SKIN:**

**ACUTE:** Dermal exposure can cause severe irritation and/or burns characterized by redness, swelling, and scab formation. Prolonged skin exposure may cause destruction of the dermis with impairment of the skin at site of contact to regenerate.

**CHRONIC:** Effects from chronic skin exposure would be similar to those from single exposure except for effects secondary to tissue destruction.

**INGESTION:**

**ACUTE:** Irritation and/or burns can occur to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration.

**CHRONIC:** There are no known or reported effects from chronic exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:**

Asthma and respiratory and cardiovascular disease.

**INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY**

None known or reported.

**ANIMAL TOXICOLOGY****ACUTE TOXICITY:**

Inhalation LC 50 - 510 mg/cubic-meter (2 hrs., rat), as sulfuric acid

Oral LD 50 - 2.14 g/kg, as sulfuric acid

Dermal LD 50 - greater than 2 g/kg (rabbit), as sulfuric acid

CAUSES BURNS TO EYES AND SKIN.

**CHRONIC TOXICITY:**

Alteration of lung structure and deterioration of lung function has been observed in primates exposed to concentrations 4 to 5 times the TLV. The damage was characterized by hyperplasia and thickening of the bronchiolar walls due to repeated irritation and inflammation.

**REPRODUCTIVE TOXICITY:**

There are no known or reported effects on reproductive function or fetal development.

**CARCINOGENICITY:**

This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA. A statistical increase in laryngeal cancer was observed in workers exposed industrially to sulfuric acid mist. These data are suggestive of a causal relationship between carcinogenesis and inhalation of the mist. Cancer has not been observed in animals exposed to sulfuric acid.

**MUTAGENICITY:**

SULFURIC ACID SOLUTION

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This product is not known or reported to be mutagenic.

#### X. TRANSPORTATION

THIS MATERIAL IS REGULATED AS A DOT HAZARDOUS MATERIAL.

DOT DESCRIPTION FROM THE HAZARDOUS MATERIALS TABLE 49 CFR 172.101:  
Sulfuric Acid, CORROSIVE MATERIAL, UN 1830

REPORTABLE QUANTITY: 1000 lbs. as 100% Sulfuric acid (Per 49 CFR 172.101, Appendix)

The material described above is subject to the U.S. DOT HAZARDOUS MATERIALS REGULATIONS via the modes and packaging quantities indicated below with the letter "x":

MODE	PACKAGING QUANTITIES	
<input checked="" type="checkbox"/> Rail	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Motor	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Water	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk
<input checked="" type="checkbox"/> Air	<input checked="" type="checkbox"/> Bulk	<input checked="" type="checkbox"/> Non-Bulk

The applicable packaging sections in 49 CFR are 173.244 and 173.272.

#### XI. SPILL & LEAKAGE

FOR ALL TRANSPORTATION ACCIDENTS, CALL CHEMTREC AT 800-424-9300.

REPORTABLE QUANTITY: 1000 lbs. as 100% Sulfuric acid (Per 40 CFR 302.4)

##### SPILL MITIGATION PROCEDURES:

Hazardous concentrations in air may be found in local spill area and immediately downwind.

DO NOT PUT WATER DIRECTLY ON THIS PRODUCT as heat evolution may occur causing a violent reaction.

Stop source of leak if safe to do so and if proper safety equipment is available. Evacuate immediate area of spill and if necessary, downwind as required.

Air Release - Vapors may be suppressed by the use of a water fog. Contain water in a diked area for treatment and disposal.

Water Release - This material is heavier than water. This material is soluble in water. Divert all water flow to a containment area for treatment. Notify other water users of possible contamination and proceed to clean up via vacuuming liquid or neutralizing as necessary.

Land Spill - Contain by creating a trench or dike made of soil, sand or other compatible materials. Accumulated liquid may be recovered via use of a vacuum truck or by pumping into compatible and approved storage containers.

SPILL RESIDUES: Dispose of per guidelines under Section XII, WASTE DISPOSAL. This material may be neutralized for disposal; you are requested to contact OCEAN at 800-OLIN-911 before beginning any such operation.

**SULFURIC ACID SOLUTION**

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**PERSONAL PROTECTION FOR EMERGENCY SPILL AND FIRE-FIGHTING SITUATIONS:**

Response to a spill of this material may require the use of a full encapsulated suit and self-contained breathing apparatus (SCBA).

In all cases protective clothing must be worn to prevent personal contact with this material. Those items include but are not limited to: boots, gloves (see below for compatible materials), hard hat, splash-proof goggles, full face shield, and impervious clothing, i.e., chemically impermeable suit.

Compatible materials for response to this material are: Neoprene, polyvinyl chloride and butyl rubber

Protection concerns must also address the potential of this product to react with various metals to form hydrogen gas creating a potential fire or explosion hazard.

**XII. WASTE DISPOSAL**

If this product becomes a waste, it meets the criteria of a hazardous waste as defined under 40 CFR 261 and would have the following EPA hazardous waste number: D002.

If this product becomes a waste, it will be a hazardous waste which is subject to the Land Disposal Restrictions under 40 CFR 268 and must be managed accordingly.

As a hazardous liquid waste, it must be disposed of in accordance with local, state and federal regulations in a permitted hazardous waste treatment, storage and disposal facility by treatment.

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL. THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS REGARDING TREATMENT, STORAGE AND DISPOSAL FOR HAZARDOUS AND NONHAZARDOUS WASTES.

**XIII. ADDITIONAL REG STATUS****TOXIC SUBSTANCES CONTROL ACT:**

This substance is listed on the Toxic Substances Control Act inventory.

**SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT TITLE III:****HAZARD CATEGORIES, PER 40 CFR 370.2:**

HEALTH: Immediate (Acute), Delayed (Chronic)

PHYSICAL: Reactivity

**EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW, PER 40 CFR 355, APP.A:****EXTREMELY HAZARDOUS SUBSTANCE - THRESHOLD PLANNING QUANTITY:**

1,000 lbs.

**SUPPLIER NOTIFICATION REQUIREMENTS, PER 40 CFR 372.45:**

This mixture or tradename product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

## SULFURIC ACID SOLUTION

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CHEMICALS LISTED ARE: Sulfuric Acid

## XIV. ADDITIONAL INFORMATION

No Additional Information

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**ATTACHMENT 2**

**DRILLING HAZARDS**

**Woodward-Clyde Consultants****SAFETY GUIDELINES FOR DRILLING**

Drill rig maintenance and safety is the responsibility of the drill rig operator. The following is provided as a general guideline for safe drilling practices on site.

**OFF-ROAD MOVEMENT OF DRILL RIGS**

The following safety guidelines relate to off-road movement:

Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gulleys, ruts and similar obstacles.

Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.

Discharge all passengers before moving a drill rig on rough or hilly terrain.

Engage the front axle (for 4x4, 6x6, etc., vehicles or carriers) when traveling off highway on hilly terrain.

Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.

Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.

Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.

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After the drill rig has been moved to a new drilling site, set all brakes and/or locks. When grades are steep, block the wheels.

Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

Tie down loads on the drill rig and support trucks during transport.

### OVERHEAD AND BURIED UTILITIES

The use of a drill rig near electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. Electricity can shock, it can burn, and it can cause death.

Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.

Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 feet.

Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.

### CLEARING THE WORK AREA

Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling

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should not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

NOTE: In coordination with the drilling crew, the SSO will review the precautions taken to insure that the drill rig is leveled and stabilized.

### HOUSEKEEPING ON AND AROUND THE DRILL RIG

The first requirement for safe field operations is that the drilling crew safety supervisor understand and fulfill the responsibility for maintenance and "housekeeping" on and around the drill rig.

Suitable storage locations should be provided for all tools, materials and supplies so that they can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.

Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.

Pipe, drill rods, bits casing, augers and similar drilling tools should be stacked in orderly fashion on racks or sills to prevent spreading, rolling or sliding.

Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.

Work areas, platforms, walkways, scaffolding and other accessways should be kept free of materials, obstructions and substances such as ice, excess grease or oil that could cause a surface to become slick or otherwise hazardous.

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Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.

Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

### SAFE USE OF HAND TOOLS

There are almost an infinite number of hand tools that can be used on or around a drill rig. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs.

When a tool becomes damaged, either repair it before using it again or get rid of it.

When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others near you to wear safety glasses.

When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.

Keep all tools cleaned and orderly stored when not in use.

Replace hook and heel jaws when they become visibly worn.

When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench

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handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

### **SAFE USE OF WIRE LINE HOISTS, WIRE ROPE AND HOISTING HARDWARE**

The use of wire line hoists, wire rope, and hoisting hardware should be as stipulated by the American Iron and Steel Institute's Wire RPE Users Manual.

All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weaving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware and any other feature that would lead to failure. Wire ropes should be replaced when inspection indicates excessive damage according to the wire rope users manual.

If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 foot (0.3m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands.

Most sheaves on drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig. Wire ropes must be properly matched with each sheave.

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The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however drills may be moved using the main hoist as the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

When stuck tools or similar loads cannot be raised with a hoist, disconnect and hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

When attempting to free a mired vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle or drill rig carrier and stay as far as possible from the wire rope. Do not attempt to use tool hoists to free a mired vehicle or drill rig carrier.

Minimize shock loading of a wire rope - apply loads smoothly and steadily.

- o Protect wire rope from sharp corners or edges.
- o Replace faulty guides and rollers.
- o Replace worn sheaves or worn sheave bearings.
- o Replace damaged safety latches on safety hooks before using.
- o Know the safe working load of the equipment and tackle being used. Never exceed this limit.

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- o Clutches and brakes of hoists should be periodically inspected and tested.
- o Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- o Always wear gloves when handling wire ropes.
- o Do not guide wire ropes on hoist drums with your hands.
- o Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- o Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public or property are created.
- o Never leave a load suspended in the air when the hoist is unattended.
- o Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- o Never hoist the load over the head, body or feet of any personnel.

### SAFE USE OF AUGERS

The following general procedures should be used when advancing a boring with continuous flight or hollow-stem augers:



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- o Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- o The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- o Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.
- o Whenever possible, use tool hoists to handle auger sections.
- o Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- o Never allow feet to get under the auger section that is being hoisted.
- o When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.
- o Never use your hands or feet to move cuttings away from the auger.

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- o Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

**SAFETY DURING ROTARY AND CORE DRILLING**

Rotary drilling tools should be safety checked prior to drilling:

- o Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
- o Drill rod chuck jaws should be checked periodically and replaced when necessary.
- o The capacities of hoists and sheaves should be checked against the anticipated weight to the drill rod string plus other expected hoisting loads. All cables should be inspected daily.

Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:

- o Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- o Drill rods should not be held or lowered into the hole with pipe wrenches.
- o If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.

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- o In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.**
- o When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.**
- o If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough surface, fitted cover panels of adequate strength to hold drill rig personnel.**
- o Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.**
- o All hydraulic lines should be periodically inspected for integrity and replaced as needed.**

**START UP**

**All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine.**

**Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct nonactuating positions, and the cathead rope is not on the cathead before starting a drill rig engine.**

**Woodward-Clyde Consultants****SAFETY DURING DRILLING OPERATIONS**

Safety requires the attention and cooperation of every worker and site visitor.

Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.

Before raising the mast (derrick), look up to check for overhead obstructions. (Refer to Section 5.2 on overhead and buried utilities.)

Before raising the mast (derrick), all drill rig personnel and visitors (with the exception of the operator) should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.

Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be releveled if it settles after initial set up. Lower the mast (derrick) only when leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.

Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.

The operator of a drill rig should only operate a drill rig from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill.

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Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.

Watch for slippery ground when mounting dismounting from the platform.

All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. All open boreholes should be covered, protected, or backfilled adequately and according to local or state regulations on completion of the drilling project.

"Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.

Be careful when lifting heavy objects.

Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.

Drilling operations should be terminated during an electrical storm.

